

# PATENT ABSTRACTS OF JAPAN

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(54) APPARATUS AND METHOD FOR THERMOFORMING OF PLASTIC

SHEET

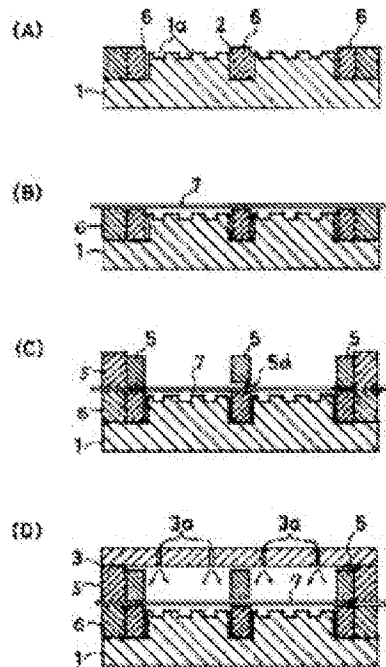
(57)Abstract:

PROBLEM TO BE SOLVED: To mold with high accuracy a number of molded articles with unevenness from a sheet by preventing non-uniform drawing of the plastic sheet from being generated.

SOLUTION: A receiving mold 1 wherein a plurality of recessed parts 1a for molding

corresponding to a plurality of plastic molded articles are provided by forming a channel 2 on its surroundings and constituting properly and a pushing plate consisting of a frame-shaped bottom plate 6 to be inserted in the channel 2 and a top plate 5 to be laminated thereon are provided and a pushing plate is inserted in the channel 2 and a plastic sheet 7 is held above the recessed parts 1a for molding of the receiving mold 1 through a little gap by means of the pushing plate and the plastic sheet 7 is brought into close contact with the receiving mold 1 by applying an external force caused by pressure difference to obtain a molded article.

[Claim(s)]



[Claim 1]In a thermoforming apparatus which fabricates two or more plastic molding from a plastic sheet, A carrier type which formed a slot in the circumference, formed suitably two or more molding recesses corresponding to two or more plastic molding, and provided them, A thermoforming apparatus providing a presser-foot board which consists of a superior lamella which can polymerize in an inferior lamella of frame shape and this which are inserted in the above-mentioned slot, and holding and fabricating a plastic sheet with the above-mentioned presser-foot board to the above-mentioned carrier type molding-recesses upper part.

[Claim 2]In a thermoforming apparatus which fabricates two or more plastic molding from a plastic sheet, A carrier type which formed some raised face part in the circumference, formed suitably two or more molding recesses corresponding to two or more plastic molding, and provided them, A thermoforming apparatus providing a superior lamella of frame shape which can polymerize in this raised face part, and holding and fabricating a plastic sheet with this raised face part and superior lamella to the above-mentioned carrier type molding-recesses upper part.

[Claim 3]In a thermoforming method which fabricates two or more plastic molding from a plastic sheet, With a thermoforming apparatus possessing a presser-foot board which consists of a formed carrier type which formed a slot in the circumference and formed suitably two or more molding recesses corresponding to two or more plastic molding, and a superior lamella which can polymerize in an inferior lamella of frame shape and this which are inserted in the above-mentioned slot. A thermoforming method holding and heating a plastic sheet with the above-mentioned presser-foot board, and holding and fabricating a plastic sheet with the above-mentioned presser-foot board succeedingly.

#### [Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention starts the molding equipment and the forming process for carrying out thermoforming of the plastic sheet with a compressed air thru/or vacuum forming, etc., and when fabricating two or more mold goods which had unevenness from one plastic sheet especially, it relates to a suitable device and method.

[0002]

[Description of the Prior Art]When fabricating the container 11 for the product package made from a plastic of \*\*\*\* shown in the former (A), for example, drawing 5, and the thin meat which has the crevice 11a by thermoforming, As shown in the figure (B), the metallic mold which installed many molding recesses side by side so that many

containers 11 for a package could be fabricated with the one plastic sheet S was used.

[0003]

[Problem(s) to be Solved by the Invention]When many mold goods were fabricated from one plastic sheet, the elongation of the plastic sheet became uneven easily by the central part, the periphery or flat part, and uneven part of the mold. Therefore, when printing was carried out to the plastic sheet, there was a problem of printing shifting and being fabricated, or the position of the crevice 11a of the above-mentioned container 11 for a package and the lid 11b shifting, and what cannot be lidded being fabricated further. If the number of the mold goods fabricated from one plastic sheet was reduced on the other hand in order to prevent such poor molding, shaping efficiency is bad and the futility of a plastic sheet also becomes large.

[0004]The place which this invention is made in view of such a problem that a Prior art has, and is made into the purpose, Uneven extension of the whole plastic sheet can be prevented on a metallic mold, many mold goods can be fabricated with high degree of accuracy from one plastic sheet, it excels in shaping efficiency, and there is also structure in providing a simple thermoforming apparatus and thermoforming method.

[0005]

[Means for Solving the Problem]In order to solve an aforementioned problem, a thermoforming apparatus of this invention which fabricates two or more plastic molding from a plastic sheet, A carrier type which formed a slot in the circumference, formed suitably two or more molding recesses corresponding to two or more plastic molding, and provided them, A presser-foot board which consists of a superior lamella which can polymerize in an inferior lamella of frame shape and this which are inserted in the above-mentioned slot is provided, and it is characterized by holding and fabricating a plastic sheet with the above-mentioned presser-foot board to the above-mentioned carrier type molding-recesses upper part.

[0006]A carrier type which a thermoforming apparatus of this invention formed some raised face part in the circumference, and formed it suitably and with which it provided two or more molding recesses corresponding to two or more plastic molding, A superior lamella of frame shape which can polymerize in this raised face part is provided, and it is characterized also by holding and fabricating a plastic sheet with this raised face part and superior lamella to the above-mentioned carrier type molding-recesses upper part.

[0007]A formed carrier type with which a thermoforming method of this invention formed a slot in the circumference, and formed suitably two or more molding recesses corresponding to two or more plastic molding, It is characterized by holding and heating a plastic sheet with the above-mentioned presser-foot board, and holding and

fabricating a plastic sheet with the above-mentioned presser-foot board succeedingly with a thermoforming apparatus possessing a presser-foot board which consists of a superior lamella which can polymerize in an inferior lamella of frame shape and this which are inserted in the above-mentioned slot.

[0008]

[Embodiment of the Invention]One suitable working example of this invention is described with reference to Drawings. The carrier type perspective view fracturing a part and in which showing the state where the front view of a presser-foot board, the sectional view, and drawing 3 which use drawing 1 for the amputation stump side figure of the metallic mold of this example thermoforming apparatus, and use drawing 2 for this example thermoforming apparatus inserted the presser-foot board, and drawing 4 are the figures showing the forming cycle of this example thermoforming apparatus.

[0009]By the thermoforming apparatus of this example forming the slot 2 in carrier type 1 of the metallic mold which receives the plastic sheet 7, pressing down in this slot 2, inserting the inferior lamella 6 of the board 4, and setting the superior lamella 5 so that the plastic sheet 7 may be fastened on this inferior lamella 6, The plastic sheet 7 is held with the presser-foot board 4, and a sheet is heated to shaping optimal temperature in this state, and it constitutes so that lid type 3 of a metallic mold may be fabricated according to carrier type 1 on it.

[0010]Two or more molding recesses 1a corresponding to one mold goods are installed by the upper surface side by side, and carrier type 1 a total of six two rows long and three rows wide molding recesses 1a in a proper number and this example as one block, The whole carrier type is divided into a small block (drawing 3 4 blocks), and the slot 2 of proper width is formed between each block, and the circumference of a block is formed and it has formed.

[0011]The number of the molding recesses 1a which constitute one block can take into consideration the number of the crevices on the size and shape of mold goods, and the surface of mold goods, the depth and shape, or the thickness of the plastic sheet 7, and can provide it suitably so that a printing gap or modification of the plastic sheet 7 may not arise at the time of shaping.

[0012]The edge part 1b of carrier type 1 is the slot 2 and a shoulder step of the depth, and it is formed so that the undersurface of the inferior lamella 6 of the presser-foot board 4 can join. Lid type 3 has the airport 3a for compressed air located in each block, and it has formed it so that the edge part 3b may press down and it can join to the upper surface of the superior lamella 5 of the board 4. Lid type 3 is provided so that it may move up and down with the oil hydraulic cylinder which is not illustrated and the

interval of carrier type 1 can be expanded and contracted, and the airtightness of the space part in a metallic mold is maintained by contacting the upper surface of the superior lamella 5 allocated on carrier type 1 in the edge part 3b. Although not illustrated, the vent of the sliding type is suitably provided in carrier type 1, and where lid type 3 is fixed on carrier type 1, the atmospheric pressure in a metallic mold can be adjusted suitably.

[0013]The presser-foot board 4 consists of the superior lamella 5 and the inferior lamella 6 which can polymerize mutually, and is formed in frame shape by proper width with the metallic material. Up-and-down both the boards 5 and 6 consist of lattice-like the seating rims 5a and 6a and the outer frames 5b and 6b, respectively, join the peripheral face of a seating rim, and the inner skin of an outer frame, respectively, and are fixed and formed in one. When it has the outline shape which can be inserted in the slot 2 of carrier type 1 and the upper surface inserts in the slot 2, the inferior lamella 6 is formed so that it may become the height which becomes high a little rather than the projected part upper surface which forms the molding recesses 1a of carrier type 1, and so that it can join to the undersurface of the superior lamella 5. The superior lamella 5 is the outline shape which may polymerize in the inferior lamella 6, and it is suitably formed in height so that the outer frame 5b may become high a little rather than the seating rim 5a. 5 d of gaps are formed in the bottom of the side part 5c of the shape of a lattice of the seating rim 5a. By carrying the plastic sheet 7 on the inferior lamella 6 inserted in the slot 2, and piling up the superior lamella 5 on it, up-and-down both the boards 5 and 6 can be isolated from the carrier draw spike side portion of the molding recesses 1a, and can hold the plastic sheet 7 now in a little high position.

[0014]It can also stick and equip with the superior lamella 5 at the tip of a move arm which was interlocked with the moving mechanism of lid type 3, and was provided so that it may allocate as a moving mechanism different from lid type 3, and it may fix to the undersurface of lid type 3 removable or the opening-and-closing operation of lid type 3 may be made to produce some time lag. The seating rim and outer frame of up-and-down both the boards 5 and 6 may be provided mutually, enabling free attachment and detachment.

[0015]The forming cycle of the thermoforming apparatus of this example which consists of this composition is as follows. First, the inferior lamella 6 is beforehand inserted in that slot 2 carrier type 1, and as shown in drawing 4 (A), as shown in the figure (B), the plastic sheet 7 is sent into the upper surface of this inferior lamella 6.

[0016]And as shown in the figure (C), from on the plastic sheet 7, the superior lamella 5 is set by it, as it polymerizes in the inferior lamella 6, it is made to clamp by the

periphery of the plastic sheet 7 in the edge part of both boards, and holds, and in this state, the plastic sheet 7 whole is heated and the plastic sheet 7 is softened. By heating, where the plastic sheet 7 is pinched with the presser-foot board 4 in this way, without dark circles, can make a sheet forming part into molding temperature, and in this state. The plastic sheet 7 is held above carrier type 1 via few crevices, and temperature unevenness does not produce it on the surface, the plastic sheet 7 maintaining a softened state, when the plastic sheet 7 does not touch the upper surface of carrier type 1.

[0017]And as shown in the figure (D), lid type 3 is moved on carrier type 1, lid type 3 is polymerized on the upper surface of the superior lamella 5, the inside of a metallic mold is sealed, from the airport 3a, compressed air is sent in and the plastic sheet 7 is stuck to the molding recesses 1a. Under the present circumstances, since the plastic sheet 7 is fastened with the up-and-down boards 5 and 6, even if concavo-convex shaping is carried out, a printing gap is not almost produced.

[0018]The plastic sheet 7 whole is released from mold, it takes out from a metallic mold, and a forming cycle is completed, for example, the plastic sheet 7 is cut out by a next process, and it is made to separate into a mold-goods simple substance after shaping.

[0019]As shown in drawing 4 (C), heating of the plastic sheet 7 is performed, where it pressed down to carrier type 1 and the board 4 is set, and also it is heated by the previous process in the state where pressed down the sheet 7 and it inserted with the board 4, and moves this to the carrier type 1 upper part, and it may be made to set it. Since direct the end of a metallic mold face can be prevented if it has composition which uses the inferior lamella 6 of the presser-foot board 4 as a different body, and uses it with carrier type 1 in combination as mentioned above, it is advantageous also from a point of metallic mold protection, but. It is also possible to have carried out integral moulding of the inferior lamella 6 to carrier type 1 as a raised face part in the above and homotopic. Similarly, it is also possible the superior lamella 5 of the presser-foot board 4 and to fabricate to lid type 3 and one. In addition. The outside of each block is not limited to the rectangle like this example, either. Although this example explained the mode by pressure forming, of course, this invention is applicable to vacuum forming or other thermoforming apparatus.

[0020]

[Effect of the Invention]Since the plastic sheet heated by shaping optimal temperature is fabricated in the state where it was held with the presser-foot board at the method of a carrier draw spike according to the thermoforming apparatus of this invention, It is hard to produce a shaping gap, and many highly precise mold goods can be produced,

without defects, such as a position gap of printing and distortion, occurring, also when printing is carried out to the plastic sheet. A shaping gap can be made hard to be able to make a sheet forming part into shaping optimal temperature without dark circles, and to produce by according to the thermoforming method of this invention, heating, where a plastic sheet is pinched with a presser-foot board.